

HAYEK ET AL.
"RF Receivers And Methods"
Atty. Docket No. CS11336

Appl. No. 09/998,489
Examiner R. Perez Gutierrez
Art Unit 2683

REMARKS

Request for Reconsideration, Informal Matters, Claims Pending

The final Office Action mailed on 18 May 2004 has been considered carefully. Reconsideration of the claimed invention in view of the amendments above and the discussion below is respectfully requested.

The title has been amended as proposed by the Examiner.

Claims 1-10 stand allowed. Claims 12 stands objected to for dependence on a rejected base or intervening claim. Claims 11-23 stand rejected on new grounds. Claims 1-25 are pending.

Allowability of Claims Over Atkinson

Rejection Summary For Claim 11

Claims 11, 13, 14, 18 & 24 stand rejected Under 35 U.S.C. 103 as being unpatentable over U.S. Patent Appl. Pub. No. 2001/0039182 (Atkinson). The Examiner alleges specifically that Atkinson discloses

... providing a local oscillator signal 24 (mixer injection frequency) (figure 2) by dividing a voltage controlled oscillator (VCO) 38 output by a frequency divide ratio (figure 2 and page 2 paragraphs 0018 and 0019),
the VCO 38 having a frequency F3 outside a bandwidth of received signal harmonics (figure 2 and page 2 paragraph 0020).

Discussion of Independent Claim 11

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Regarding Claim 11, contrary to the Examiner's assertion, Atkinson fails to disclose or suggest a method in a receiver, comprising:

... providing a mixer injection frequency by dividing a voltage controlled oscillator output by a frequency divide ratio, the voltage controlled oscillator having a frequency outside a bandwidth of received signal harmonics.

Atkinson discloses at para. 0020 (referenced by the Examiner) that

... [t]he frequency of the F_3 of the signal from the voltage controlled oscillator is ... not harmonically related ... to the frequency of the in RF signal ... because the frequency of the input RF signal is equal to $\frac{4}{3} F_3$.

Atkinson is silent on the relationship between the VCO frequency and the bandwidth of received signal harmonics. The Examiner's assertion otherwise is not support by the prior art. In Atkinson, the VCO frequency may be within or without the received signal harmonics. Independent Claim 11 and dependent Claims 12-18 are thus patentably distinguished over Atkinson and in condition for allowance.

Rejection Summary For Claims 13, 14 & 18

Claims 13, 14 and 18 stand rejected as being unpatentable over Atkinson under 35 USC 103. The Examiner contends that it would have been obvious to

... modify the teaching of Atkinson to specifically select a frequency divide ratio greater or equal to one that would have maintained the local oscillator frequency outside the bandwidth of

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harmonics or fundamental frequency of the received signal in order to prevent leakage of the local oscillator frequency.

Discussion of Claim 13

Regarding Claim 13, contrary to the Examiner's assertion, Atkinson does not disclose or suggest

... the frequency divide ratio is $q = 1$, mixing the received signal at a mixer injection frequency outside a bandwidth of a fundamental frequency of the received signal

in combination with the limitations of Claim 1. According to Atkinson, at para. [0020], "... [t]he frequency of the F_3 of the signal from the voltage controlled oscillator is ... not harmonically related ... to the frequency of the in RF signal ... because the frequency of the input RF signal is equal to $\frac{4}{3} F_3$." In Atkinson, if the divide ratio = 1, the VCO 38 frequency F_3 would be equal to the frequency of the input RF signal, contrary to the teaching of Atkinson. Thus Atkinson does not suggest that the "... frequency divide ratio $q = 1$..." as in Claim 13. Claim 13 is thus patentably distinguished over Atkinson.

Discussion of Claim 14

Regarding Claim 14, contrary to the Examiner's assertion, the frequency divide ratio in Atkinson is < 1 , since Atkinson multiplies the VCO frequency F_3 by $\frac{4}{3}$. Additionally, Atkinson does not disclose or suggest "... mixing the received signal at a mixer injection frequency derived from a VCO frequency that is outside a bandwidth of the n^{th} harmonic of the received signal, where the frequency divide ratio q equals the harmonic number n " as

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recited in Claim 14. The Examiner's action does not expressly address the limitations of Claim 14. Claim 14 is thus patentably distinguished over Atkinson and in condition for allowance.

Discussion of Claim 18

Regarding Claim 18, contrary to the Examiner's assertion, Atkinson fails to disclose or suggest "... mixing the received signal at a mixer injection frequency outside a channel bandwidth of the received signal." As noted, Atkinson merely provides a VCO frequency that is not harmonically related to the frequency of the input RF signal, without regard to whether or not the mixer injection frequency is outside the bandwidth or outside the channel bandwidth of the received signal. Claim 18 is thus patentably distinguished over Atkinson.

Discussion of Independent Claim 24

Atkinson fails to disclose or suggest a method in intermediate frequency and direct conversion receivers, comprising:

... providing a mixer injection frequency at a frequency different than the receive frequency by dividing a voltage controlled oscillator output by a frequency divide ratio,
the voltage controlled oscillator having a frequency outside a bandwidth of received signal harmonics.

In Atkinson, the mixer injection frequency (34) is the same as the received signal frequency. Atkinson, para. [0019]. As noted above, Atkinson is silent on the relationship between the VCO frequency and the bandwidth of

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received signal harmonics. The Examiner's assertion otherwise is not support by the prior art. In Atkinson, the VCO frequency may be within or without the received signal harmonics. Claim 24 is thus patentably distinguished over the art.

Allowability of Claims Over Atkinson & Freed

Rejection Summary

Claims 15-17 stand rejected under 35 USC 103 as being unpatentable over Atkinson in view of US Patent No. 6,487,419 (Freed). The Examiner concedes that Atkinson fails to disclose "... determining the signal strength and bit error rate of the received signal and increasing a gain of the received signal before mixing if the gain of the signal received signal is below a gain threshold" but asserts that these actions would have been made obvious in light of the teaching of Freed "... in order to efficiently manage the power consumption of the wireless device."

Discussion of Claim 15

Regarding Claim 15, Atkinson does not suggest

... determining a condition of the received signal;
mixing the received signal at the mixer injection frequency derived from a VCO frequency that is outside the bandwidth of the harmonics of the received signal only if the condition of the received signal is above a threshold.

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Contrary to the Examiner's assertion, neither Atkinson nor Freed disclose or suggest conditional mixing. Examiner's does not specifically address the conditional limitation of Claim 15. Claim 15 is thus patentably distinguished over Atkinson and Freed.

Discussion of Claim 16

Regarding Claim 16, neither Atkinson nor Freed disclose or suggest "... determining the condition of the received signal by determining a strength thereof" in combination with the limitations of Claim 11. Claim 16 is thus patentably distinguished over Atkinson and Freed.

Discussion of Claim 17

Regarding Claim 17, neither Atkinson nor Freed disclose or suggest "... determining the condition of the received signal by determining a signal strength and bit error rate (BER) thereof, increasing a gain of the received signal before mixing if the gain of the received signal is below a gain threshold" in combination with the limitations of Claim 11. Claim 17 is thus patentably distinguished over Atkinson and Freed.

Allowability of Claims Over Arpaia

Rejection Summary

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Claims 19 & 25 stand rejected under 35 USC 103 as being unpatentable over US Patent No. 6,192,225 (Arpaia).

Discussion of Independent Claim 19

Regarding Claim 19, Arpaia fails to disclose or suggest a method in an RF receiver, comprising:

- ... receiving a signal within a passband of a pre-selection filter of the receiver;
- mixing the received signal at a mixer injection frequency outside the passband of the pre-selection filter;
- chopping the received signal before and after mixing at the same chopper frequency,
- the chopper frequency proportional to the mixer injection frequency.

Contrary to the Examiner's assertion, Arpaia does not mix the received signal with "... a mixer injection frequency outside the passband of the pre-selection filter..." In Arpaia, the frequency of the switching oscillator (7) is greater than the bandwidth of the preselector filter. Arpaia, col. 4, lines 47-50 & lines 63- 67. In Arpaia, the switching oscillator, which controls the chop rate, is not the same as the mixer injection frequency. In Arpaia, the frequency f_0 of the local oscillator (4) (mixer injection frequency) is the same as the carrier frequency of the received signal. Arpaia, col. 4, lines 6-8. Arpaia's disclosure of a frequency greater than the bandwidth of the pre-selection filter is not the same as a "... frequency outside the passband of the pre-selection filter...."

Also, Arpaia does not chop the received signal at a "... chopper frequency proportional to the mixer injection frequency." In Arpaia, the inverters 9, 9' "chop up" second order products by switching the polarity of

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the signal at the same rates as the switching oscillator (9). Arpaia, col. 4, lines 40-44. In Arpaia, the local oscillator (40) and the switching oscillator (7) are separate oscillators, and thus there is no implication that the frequencies thereof are proportional. Claim 19 and dependent Claims 20-21 are therefore patentably distinguished over the art.

Discussion of Independent Claim 25

Regarding new independent Claim 25, Arpaia fails to disclose or suggest a method in an RF receiver, comprising

- ... receiving a signal within a passband of a pre-selection filter of the receiver;
- mixing the received signal at a mixer injection frequency outside the passband of the pre-selection filter;
- chopping the received signal at a chopper frequency proportional to the mixer injection frequency.

As noted above, in Arpaia, only the frequency of the switching oscillator (7) is greater than the bandwidth of the preselector filter; chopping is performed at the same rate as the switching oscillator. As noted, in Arpaia, the frequency f_o of the local oscillator (4) (mixer injection frequency) is the same as the carrier frequency of the received signal. Claim 25 is thus patentably distinguished over Arpaia.

Allowability of Claims Over Arpaia & Freed

Rejection Summary

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Claims 20 and 21 stand rejected under 35 USC 103 as being unpatentable over Arpaia in view of Freed.

Discussion of Claim 20

Regarding dependent Claim 20, neither Arpaia nor Freed disclose or suggest "... increasing a gain of the received signal before mixing if the received signal gain is below a threshold" in combination with Claim 19. Claim 20 is thus patentably distinguished over the art.

Discussion of Claim 21

Regarding dependent Claim 21, neither Arpaia nor Freed disclose or suggest "... mixing the received signal at the mixer injection frequency outside the passband of the pre-selection filter when the measured gain is above a threshold, mixing the received signal at a mixer injection frequency within the passband of the pre-selection filter if the measured gain is below the threshold." The Examiner does not explicitly address the conditional mixing of the receive signal, which is not addressed by Arpaia or Freed. Claim 21 is thus patentably distinguished over the art.

Allowability of Claims Over Arpaia & Atkinson

Rejection Summary

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Claims 22 and 23 stand rejected Under 35 USC 103 as being unpatentable over Arpaia in view of Atkinson. The Examiner alleges specifically that it would have been obvious to

... modify the teachings of Arpaia et al, with the teachings of Atkinson to specifically select a frequency divide ratio greater than or equal to one that would have maintained the local oscillator frequency outside the bandwidth of harmonics or fundamental frequency of the received signal"

Discussion of Independent Claim 22

As noted above, Atkinson multiplies the frequency F_3 of the VCO 38 by a factor of $4/3$, which corresponds to a frequency divide ratio in Atkinson that is < 1 . See Atkinson, para. [0019]. Also, Atkinson does not distinguish between a VCO having a frequency that is within or without the bandwidth of the received signal harmonics. Atkinson merely indicates that the frequency of the VCO is "... not harmonically related ... to the frequency of the input RF signal." Thus there is no disclosure or suggestion in either Atkinson or Arpaia for a method in intermediate frequency and direct conversion receivers, comprising

... chopping a received signal;
mixing the received signal after chopping at a mixer injection frequency;
deriving the mixer injection frequency from a voltage controlled oscillator signal frequency outside a bandwidth of received signal harmonics.

Claim 22 and dependent Claim 23 is thus patentably distinguished over Atkinson and Arpaia.

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Discussion of Claim 23

Regarding Claim 23, contrary to the Examiner's assertion, neither Arpaia nor Atkinson disclose or suggest that the

... providing the mixer injection frequency derived from a VCO frequency that is outside a bandwidth of the harmonics of the received signal by dividing a voltage controlled oscillator output by a frequency divide ratio,
a harmonic of the received signal corresponding to the divide ratio of the frequency divider.

Neither Arpaia nor Atkinson disclose or suggest dividing a VCO output by a frequency divider that corresponds to a harmonic of the received signal. The Examiner's action does not specifically address the limitations of Claim 23. Claim 23 is thus patentably distinguished over the art.

Prayer for Relief

In view of the amendments and the discussion above, the Claims of the present application are in condition for allowance. Kindly withdraw any rejections and objections and allow this application to issue as a United States Patent without further delay.

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Respectfully submitted,



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